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SPECTROSCOPY.—*Regularities in the arc spectrum of lanthanum.*[1]
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Although regularities among lines of the spark spectrum of lanthanum (La II) have been known for some time,[2] nothing concerning the structure of the arc spectrum of this element (La I) has heretofore been published. With the aid of new data, the analysis of the La II spectrum has recently been extended,[3] and the first regularities in the La I spectrum were detected. The new descriptive material included an extensive list of temperature classifications of lanthanum lines by Dr. King and Miss Carter,[4] and some unpublished Zeeman-effects observed by the late Professor B. E. Moore. The temperature classification has been especially valuable on account of its division of the La lines into two sets, one set (La I) characterizing the neutral atom and the other (La II) the ionized atom of lanthanum. The multiplets in either spectrum have a large wave length range so that estimation of line intensities becomes very difficult and there is furthermore a possibility that certain deviations from the intensity rules might be expected for heavy atoms like La. Nevertheless, the estimates of line intensities by King and Carter have been very useful in the construction of multiplets and it appears that the intensity rules are usually fulfilled, at least qualitatively. In a similar manner deviations from the Landé g values might be expected to produce some strange Zeeman-effects for La I lines since such have already

[1] Published by permission of the Director of the Bureau of Standards. Received December 9, 1926.

[2] POPOW, Ann. der Physik, **45**: 147. 1914.
PAULSON, Ann. der Physik, **45**: 1203. 1914.
GOUDSMIT, Kon. Akad. Wet. Amsterdam, **33**: No. 8. 1924.

[3] MEGGERS, J. O. S. A. & R. S. I. In press.

[4] KING and CARTER, Astrophys. Journ. In press.

TABLE 1.—Relative Terms in the La I Spectrum

TERM SYMBOL	TERM VALUE	LEVEL SEPARATION	COMBINATIONS
a^3D_3	00.0		a^3P, b^3P, $a^3\overline{D}$, $b^3\overline{D}$, $c^3\overline{D}$, $d^3\overline{D}$, a^3F, b^3F, c^3F, d^3F, e^3F, I, II, III, IV, $a^4\overline{D}$, a^4F, b^4F, $a^4\overline{G}$
		1053.2	
a^3D_2	1053.2		
$a^4\overline{F}_2$	2668.2		a^2P, $a^3\overline{D}$, $b^3\overline{D}$, $c^3\overline{D}$, a^3F, b^3F, c^3F, $a^4\overline{D}$, a^4F, b^4F, $a^4\overline{G}$
		341.8	
$a^4\overline{F}_3$	3010.0		
		484.6	
$a^4\overline{F}_4$	3494.6		
		627.0	
$a^4\overline{F}_5$	4121.6		
I	14804.1		a^3D, $a^4\overline{F}$
$a^3\overline{D}_2$	15031.7		a^3D, $a^4\overline{F}$
		1506.7	
II	15196.8		a^3D, $a^4\overline{F}$
$a^3\overline{D}_3$	16538.4		
a^3F_3	16856.9		a^3D, $a^4\overline{F}$
		1053.3	
$b^3\overline{D}_2$?	17699.8		a^3D, $a^4\overline{F}$
a^3F_4	17910.2		
		247.3	
$b^3\overline{D}_3$	17947.1		
$a^4\overline{G}_3$	18156.9		a^3D, $a^4\overline{F}$
$c^3\overline{D}_3$	18172.3		a^3D, $a^4\overline{F}$
		447.0	
		1207.1	
$a^4\overline{G}_4$	18603.9		
		525.4	
$a^4\overline{G}_5$	19129.3		
$c^3\overline{D}_2$	19379.4		
a^3P_2	20019.1		a^3D, $a^4\overline{F}$
		988.1	
a^4F_2	20083.0		a^3D, $a^4\overline{F}$
		178.3	
$a^4\overline{G}_6$	20117.4		
		255.2	
a^3P_1	20197.4		
a^4F_3	20338.2		
		425.0	
a^4F_4	20763.2		
		620.8	
b^3F_3	20972.1		a^3D, $a^4\overline{F}$
a^4F_5	21384.0		
		475.8	
b^3F_4	21447.9		
c^3F_4?	21662.5		a^3D, $a^4\overline{F}$

TERM SYMBOL	TERM VALUE	LEVEL SEPARATION	COMBINATIONS
$a^4\overline{D}_1$	22246.6		a^2D, $a^4\overline{F}$
		192.8	
$a^4\overline{D}_2$	22439.4		
		364.9	
$a^4\overline{D}_3$	22804.3		
		498.9	
$a^4\overline{D}_4$	23303.2		
d^2F_3	23875.0		a^2D, $a^4\overline{F}$
		534.7	
d^2F_4	24409.7		
b^4F_2	24507.8		a^2D
		476.5	
b^4F_3	24984.3		
e^2F_4?	25218.1		a^2D
		396.0	
b^4F_4	25380.3	424.9	
e^2F_5?	25643.0	616.7	
b^4F_5	25997.0		
III	27022.7		a^2D, $a^4\overline{F}$
b^2P_1?	27968.7		a^2D
		253.7	
b^2P_2?	28722.4		
d^2D_3?	29502.3		a^2D
		62.7	
d^2D_2?	29565.0		
IV	30788.5		a^2D
V	30897.0		a^2D

been noted[5] for La II lines. Even though the available Zeeman-effect data for La I lines are not very precise, they nevertheless serve to identify most of the important levels in the doublet- and quartet-systems of spectral terms.

The relative terms, comprising 48 levels in the La I spectrum are presented in Table 1 in which the successive columns contain (1) the term symbol for each level, (2) the relative energy value on the basis of $a^2D_2 = 0.0$, (3) the level separations of the complex terms, and (4) a summary of the term combinations. Until better criteria are available the spectroscopic symbols suggested for several of the levels must remain in doubt; five of the levels are tentatively represented by Roman numerals.

[5] GOUDSMIT, Kon. Akad. Wet. Amsterdam, **33**: No. 8. 1924.

As in scandium[6] and yttrium,[7] likewise in lanthanum the lowest energy (normal state) of the atom is represented by a doublet-D, and the first metastable state by a quartet-F term. According to the theory of Heisenberg and Hund[8] the former results from the ds^2 configuration of 3 electrons, and the latter from d^2s; the first triad of quartet terms (^4D, ^4F, ^4G) arising from the d^2p arrangement.

It is of interest to compare the interval ratios of the metastable quartet-F term with the theoretical values, since in yttrium a most remarkable agreement was found[9] for the analogous term. The interval rule is indeed obeyed by this term almost equally well in all three spectra (Sc I, Yt I, La I), as can be seen from the following:

	Separations			Ratios		
Theoretical	$^4F_3-{}^4F_4$:	$^4F_4-{}^4F_5$:	$^4F_5-{}^4F_2 = 9.00$:	7.00 :	5.00
21 Sc	66.9 :	52.5 :	37.8 = 9.00 :	7.06 :	5.08
39 Yt	254.1 :	199.4 :	141.3 = 9.00 :	7.06 :	5.00
57 La	627.0 :	484.6 :	341.8 = 9.00 :	6.95 :	4.90

If this is not a coincidence it indicates that small, progressive changes in the interval ratios occur for analogous terms in spectra of elements in successive periods.

The combinations of terms in Table 1 are given in detail in Table 2, beginning with combinations of doublet with doublet terms. These are followed in order by doublet-quartet, quartet-quartet, and quartet-doublet combinations. The symbols and term values of the low levels are placed at the head of the table, and the data for the higher levels at the left margin. The differences of the combining term values are represented in the body of the table by the vacuum wave numbers of the spectral lines. Wave length data are printed immediately above the wave numbers, and are followed by parentheses containing intensity estimates and temperature classes as given by King and Carter. The wave lengths shorter than 5500A are from the measurements of Wolff[10] and the longer ones are by Kiess;[11] the former being converted from Rowland's scale to the International Angstrom scale of wave lengths in which the latter were measured.

[6] MEGGERS, This JOURNAL **14**: 419. 1924.
[7] MEGGERS, This JOURNAL **14**: 419. 1924.
MEGGERS and MOORE, This JOURNAL **15**: 207. 1925.
MEGGERS and KIESS, J. O. S. A. & R. S. I., **12**: 417. 1926.
[8] HEISENBERG, Zeitschr. f. Phys. **32**: 841. 1925.
HUND, Zeitschr. f. Phys. **33**: 345. 1925.
[9] MEGGERS and MOORE, This JOURNAL **15**: 207. 1925.
[10] WOLFF, Zeitschr. f. wiss. Phot. **3**: 395. 1905.
[11] KIESS, Sci. Pap. Bur. Stand. **17**: 324. 1921.

TABLE 2.—COMBINATIONS IN THE La I SPECTRUM

	a^2D_3 1053.2	a^2D_2 00.0
V	3349.81(3 III A)	3235.64(5 III A)
30897.0	29843.88	30896.90
IV	3362.03(12 III A)	3247.03(8 II A)
30788.5	29735.42	30788.50
d^2D_3?	3514.07(20 II A)	3388.60(12 II A)
29502.3	28448.93	29502.27
d^2D_2?	—— ?	3381.42(15 II A)
29565.0	28511.8	29564.95
b^2P_2?	3613.10(30 II)	3480.61(8 III A)
28722.4	27669.18	28722.40
b^2P_1?		3574.41(50 II)
27968.7		27968.68
III	—— ?	3699.54(12 III A)
27022.7	25969.7	27022.87
e^2F_3?	4065.58(30 II)	3898.60(40 II)
25643.0	24589.80	25642.97
e^2F_4?	4137.02(40 I)	
25218.1	24165.17	
d^2F_4	4280.27(100 I)	
24409.7	23356.47	
d^2F_3	4380.56(12 II A)	4187.31(125 I)
23875.0	22821.74	23874.97
c^2F_4?	4850.79(20 I)	
21662.5	20609.44	
b^2F_4	4901.86(25 I)	
21447.9	20394.75	
b^2F_3	—— ?	4766.90(100 I)
20972.1	19918.9	20972.15
a^2P_2	5271.19(150 I)	4993.85(20 II)
20019.1	18965.78	20019.06
a^2P_1		4949.76(200 I)
20197.4		20197.36
c^2D_3	5455.11(400 I)	5158.69(80 I)
19379.4	18326.36	19379.38
c^2D_2	5839.78(20 II A)	5501.35(300 I)
18172.3	17119.19	18172.32
b^2D_3	5917.62(15 II A)	5570.38(5 II A)
17947.1	16894.01	17947.11
b^2D_2?	—— ?	5648.26(80 III)
17699.8	16645.6	17699.69
a^2F_4	5930.60(400 I)	
17910.2	16857.05	

TABLE 2—*Continued*

	a^3D_3 1053.2	a^3D_2 00.0
a^3F_2 16856.9	6325.92(150 I) 15803.62	5930.60(400 I) 16857.05
a^3D_3 16538.4	6455.98(300 I) 15485.25	6044.85(2 III A) 16538.44
a^3D_2 15031.7	—— ? 13978.5	6650.80(100 I A) 15031.65
II 15196.8	7068.32(100 II) 14143.73	6578.52(400 I) 15196.81
I 14804.1	7270.08(5 II A) 13751.24	6753.04(50 I A) 14804.07
$a^1\overline{D}_4$ 23303.2	4493.14(25 I) 22249.93	
$a^1\overline{D}_3$ 22804.3	4596.18(10 I) 21751.12	—— ? 22804.3
$a^1\overline{D}_2$ 22439.4	—— ? 21386.2	4455.24(10 II A) 22439.12
$a^1\overline{D}_1$ 22246.6		4493.82(10 I A) 22246.57
a^1F_3 21384.0		
a^1F_4 20763.2	5072.12(1 III A) 19710.14	
a^1F_3 20338.2	5183.89(20 II) 19285.18	—— ? 20338.2
a^1F_2 20083.0	5253.46(100 I) 19029.80	4977.92(8 II A) 20083.11
b^5F_5 25997.0		
b^5F_4 25380.3	4109.49(15 II A) 24327.09	
b^5F_3 24984.3	4177.47(30 I) 23931.18	—— ? 24984.3
b^5F_2 24507.8	4262.35(15 II A) 23454.67	4079.18(40 I) 24507.87
$a^3\overline{G}_5$ 20117.4		
$a^3\overline{G}_4$ 19129.3		
$a^3\overline{G}_4$ 18603.9	5696.19(40 I) 17550.73	
$a^3\overline{G}_3$ 18156.9	5845.02(6 II A) 17103.85	5506.07(40 II) 18156.76

TABLE 2—*Continued*

	$a^4\overline{F}_3$ 4121.6	$a^4\overline{F}_4$ 3494.6	$a^4\overline{F}_5$ 3010.0	$a^4\overline{F}_7$ 2668.2
$a^4\overline{D}_4$ 23303.2	5211.87(300 II) 19181.65	5046.87(60 III) 19808.76	—— ? 20293.2	
$a^4\overline{D}_3$ 22804.3		5177.30(300 II) 19309.73	5050.56(80 II) 19794.26	4964.81(4 III A) 20136.16
$a^4\overline{D}_2$ 22439.4			5145.42(200 II) 19429.36	5056.46(80 II) 19771.20
$a^4\overline{D}_1$ 22246.6				5106.24(150 II) 19578.44
a^4F_5 21384.0	5791.33(400 I) 17262.40	5588.35(80 II) 17889.42		
a^4F_4 20763.2	6007.37(50 III A) 16641.63	5789.23(250 I) 17268.66	5631.22(100 I) 17753.24	
a^4F_3 20338.2		5935.26(15 II A) 16843.80	5769.37(80 I) 17328.12	5657.74(50 II) 17670.00
a^4F_2 20083.0			5855.58(15 II A) 17073.00	5740.65(100 I) 17414.82
b^4F_5 25997.0	4570.14(250 I) 21875.06	4442.67(12 II) 22502.67		
b^4F_4 25380.3	4702.63(10 I) 21258.77	4567.92(200 I) 21885.67	4468.98(25 II) 22370.22	
b^4F_3 24984.3		4652.12(20 I) 21489.61	4549.51(50 I) 21974.24	4479.82(15 II A) 22316.08
b^4F_2 24507.8			4650.35(15 I) 21497.75	—— ? 21839.6
$a^4\overline{G}_6$ 20117.4	6249.92(500 I) 15995.79			
$a^4\overline{G}_5$ 19129.3	6661.40(80 I A) 15007.71	6394.24(600 I) 15634.76		
$a^4\overline{G}_4$ 18603.9	6903.07(1 III A) 14482.31	6616.59(80 I) 15109.37	6410.96(300 I) 15593.93	
$a^4\overline{G}_3$ 18156.9		—— ? 14662.3	6600.17(50 II A) 15146.97	6454.51(200 I) 15488.77
III 27022.7			4163.30(8 III A) 24012.65	4104.88(60 I) 24354.43
e^2F_3? 25643.0		—— ? 22148.4	4417.11(6 III) 22632.89	—— ? 22974.8
e^2F_2? 25218.1	—— ? 21096.5	4602.04(20 III) 21723.42	4501.59(10 II A) 22208.15	
d^2F_4 24409.7	—— ? 20283.1	4779.90(4 II) 20915.13	—— ? 21399.7	

TABLE 2—*Concluded*

	$a^4\overline{F}_5$ 4121.6	$a^4\overline{F}_4$ 3494.6	$a^4\overline{F}_3$ 3010.0	$a^4\overline{F}_2$ 2668.2
d^2F_3 23875.0		—— ? 20380.4	4791.38(5 II) 20864.98	4714.13(5 I) 21206.92
c^2F_4? 21662.5	5099.38(5 III) 17540.91	5502.66(10 III) 18168.01	5359.72(2 III A) 18652.52	
b^2F_4 21447.9	5769.99(25 III A) 17326.25	5568.48(50 II) 17953.25	5422.09(3 III A) 18437.96	
b^2F_3 20972.1		5720.03(10 III A) 17477.50	5565.74(20 II) 17962.10	—— ? 18303.9
a^2P_2 20019.1			5877.63(2 III A) 17008.96	5761.84(60 I) 17350.76
a^2P_1 20197.4				5703.29(10 III) 17528.90
c^2D_3 19379.4		6293.57(80 II A) 15884.85	6107.27(12 II A) 16369.43	5982.34(5 III A) 16711.26
c^2D_2 18172.3			6593.46(60 I) 15162.37	6448.15(60? II A) 15504.05
b^2D_3 17947.1		6917.24(10 III A) 14452.65	6692.88(30 I A) 14937.13	6543.15(500 I) 15278.95
b^2D_2 17699.8			—— ? 14689.8	6650.80(100 I A) 15031.65
a^2F_4 17910.2	—— ? 13788.6	6934.98(50 III) 14415.76	6709.50(200 I) 14900.14	
a^2F_3 16856.9		—— ? 13362.3	7219.88(15 II A) 13846.83	7045.93(300 II) 14188.67
a^2D_2 16538.4		7664.33(10? III) 13043.87	—— ? 13528.4	—— ? 13870.2
a^2D_3 15031.7			8316.03(2 IV A) 12021.67	8086.07(15 III) 12363.55
II 15196.8			8203.39(1) K 12186.73	7979.75(3n?) K 12528.30
I 14804.1		8839.67(1) K 11309.54	8476.48(2) K 11794.11	

Comparisons of the 3-electron spectra, Sc I, Yt I, La I, can best be drawn from energy diagrams, and for this purpose references will be made to Figures 1, 2, and 3, in which the various spectral terms are plotted as rectangles at distances from the zero axis proportional to their energies. The vertical height of each rectangle represents the range of the sub-levels in the term; the increase of these separa-

tions with atomic number is very noticeable. Each line connecting two spectral terms represents all the combination possibilities between the sub-levels of the combining terms, that is, a *multiplet* of spectral lines.

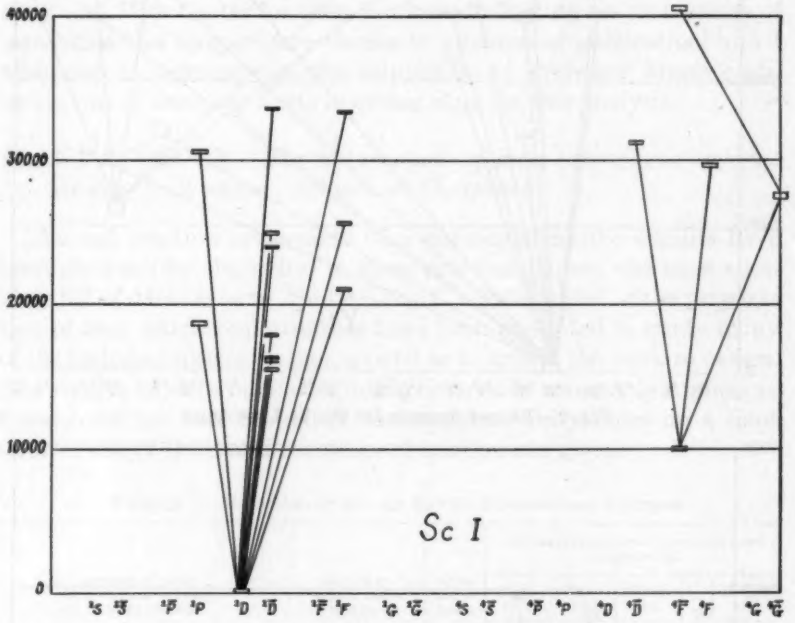

Fig. 1.—Energy diagram for the Sc I spectrum

Whereas in Yt I the quartet-F is about 11000 cm.$^{-1}$ above the doublet-D term, in La I it is only about 3000 units high. The value of quartet-F relative to doublet-D has not yet been established in Sc I, although the intersystem combinations have been sought for diligently. The reason is probably found in the weakness of these connecting lines. In the spark spectra of these three elements a remarkable increase of intensity of intersystem combinations was observed[3] as the atomic number increased. A similar state of affairs is now strikingly evident in the arc spectra; no intersystem connection has been detected in Sc I, the strongest one in Yt I has intensity 20, while in La I the strongest one is marked 500. In the absence of intersystem combinations for Sc I the low quartet-F term in Fig. 1

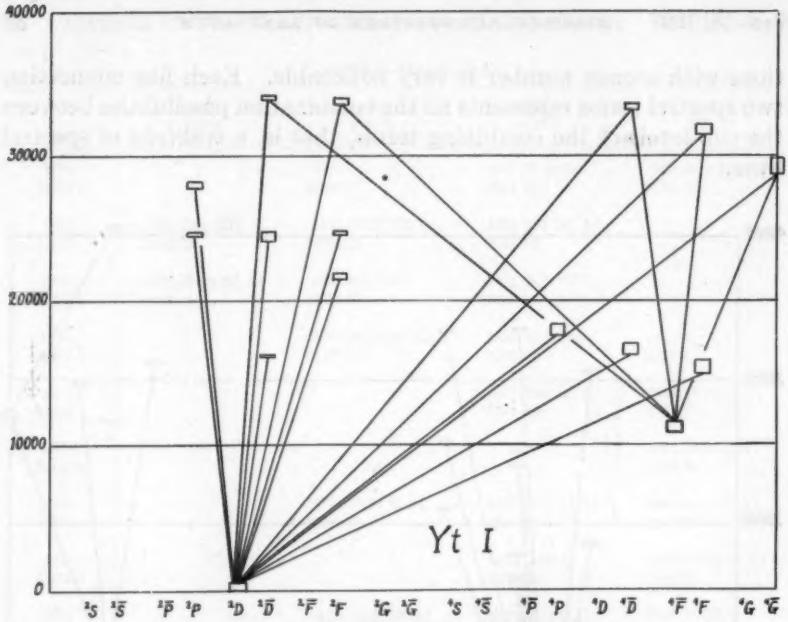

Fig. 2.—Energy diagram for the Yt I spectrum

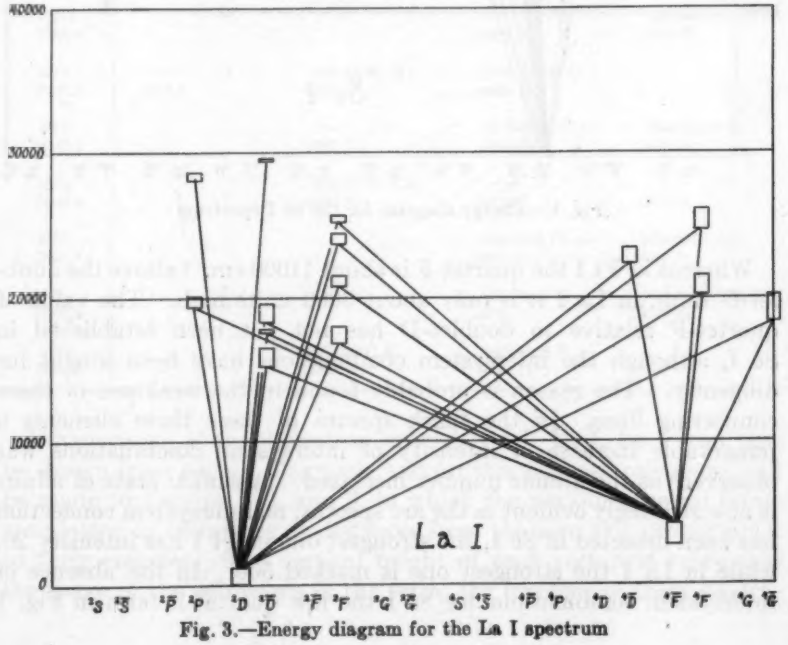

Fig. 3.—Energy diagram for the La I spectrum

is tentatively placed 10000 cm.$^{-1}$ above doublet-D. Laporte has predicted[12] that this difference will be about 11000 cm.$^{-1}$.

My plan is to extend the analysis of the La I spectrum in connection with investigations of the Zeeman-effects and hyperfine structures of the spectral lines. I take this opportunity to thank Dr. King and Miss Carter for their kindness in lending me their tables of intensities and temperature classes in advance of publication, and I wish also to acknowledge the helpfulness of Professor Moore's observations of Zeeman-effects in giving clues for this analysis.

PLANT ECOLOGY.—*The soil reactions of some saprophytic orchids.*[1] EDGAR T. WHERRY, Bureau of Chemistry.

The soil reaction preferences of a number of native orchids have been recorded by the writer in three previous papers, the most complete list of data being in "Soil Acidity."[2] Subsequent to the preparation of that article opportunities have been presented to study many of the included species further, as well as to extend the work to others. The results to date on the saprophytic species commonly known as Coral-roots are here tabulated, and supplementary notes on a color form of one of them and the range of another are given.

TABLE 1.—SOIL REACTIONS OF SEVEN SAPROPHYTIC ORCHIDS

SPECIES STUDIED (C. = CORALLORRHIZA) (H. = HEXALECTRIS)	STATES IN WHICH TESTS WERE MADE	NUMBER OF TESTS	SOIL REACTION-RANGE AND APPARENT OPTIMUM (X)								
			Medi-acid		Sub-acid		Minim-acid			Minim-alk.	
			High	Low	High	Low	High	Low	Neutral	Low	High
C. maculata (mult.)	Md.-Me.	25	—	x	X	x	x	—	—	—	—
C. odontorhiza	Va.-Md.	50	—	x	x	X	x	—	—	—	—
C. trifida (Cor.)	N. Y.-Me.	25	—	x	x	x	X	x	x	—	—
C. wisteriana	Va.-Md.	25	—	—	—	x	x	X	x	x	—
C. striata	Mich.-Ont.	10	—	—	—	—	x	X	x	x	—
C. micrantha	Fla.	5	—	—	—	—	—	x	X	x	—
H. spicata (aph.)	Fla.-Md.	25	—	—	—	—	x	x	X	x	x

The data presented in Table 1 have been obtained chiefly by stirring up the soil from the immediate vicinity of the plant roots with four times its volume of distilled water, allowing the mixture to settle for

[12] LAPORTE, Zeitschr. f. Phys. **39**: 123. 1926.

[1] Received Dec. 13, 1926.

[2] Smithsonian Report **1920**: 264. 1922.

several minutes, and determining the active acidity or alkalinity of the extract with a double-wedge comparator. The summarized results are grouped in reaction-classes designated by names rather than by numerical values, in accordance with suggestions recently published in "Soil Reaction in Relation to Horticulture.[3]"

In the course of these studies a well-marked pale form of the Autumn Coral-root, *Corallorrhiza odontorhiza* Nutt., has been recognized, and as no such form of this species appears to have been named, it is here placed on record as:

Corallorhiza odontorhiza forma **flavida** n. f.—Plant in every respect like the typical form of the species except in the lack of all traces of purple color, the lip being pure white without spots, and the sepals, ovaries, bracts, and stem being dull yellow, of varying shades of Ridgway's no. 23.

Type locality, ravine west of Pierce Mill, Washington, D. C., just outside of Rock Creek Park, in the Piedmont physiographic province; collected by Mrs. Nellie C. Knappen, September 15, 1924; type specimen in the U. S. National Herbarium, no. 1,285,622.

A large colony was found by the writer a few hundred meters north of Bull Run Postoffice, Fairfax County, Virginia, October 13, 1926, also in the Piedmont, and the accompanying illustration is made from a photograph taken there. Three stalks from this locality have been deposited in the National Herbarium, preserved in a mixture of acetic acid, ethanol, formaldehyde, and glycerol, in which their color and texture appear to remain essentially unchanged. The habitat at both localities is a thin oak-pine woods on clayey soil, of low subacid reaction, active acidity 10–25, (pH 6.0–5.6).

It is also desired to place on record an extension of range of the Crested Coral-root *Hexalectris spicata* (Walt.) Barnhart. The northernmost locality at which this plant appears to have been reported in the literature is Williamsburg, in the Coastal Plain of Virginia, where it was found by the late E. J. Grimes.[4] There are, however, specimens in the U. S. National Herbarium collected by Miss M. J. Rathbun at Delaplane, in the Blue Ridge of Virginia, considerably further northwest. In mid-August, 1923, a single flowering stalk of this species was found by Miss F. W. Layton on an islet in Rhodes River, about 12 kilometers southwest of Annapolis, in Anne Arundel County, in the Coastal Plain province of Maryland, its range being thus extended into a new state, and to a point 150 kilometers north of Williamsburg and 125 kilometers east of Delaplane. The plant was pressed and deposited in the National Herbarium. In July of

[3] Amer. Hort. Soc. Bull. 4. 1926.
[4] Rhodora **24**: 150. 1922.

the following year another stalk appeared a few meters away; this was not disturbed, but did not reappear in 1926, nor could any trace of the species be found this year in spite of the most careful search of the vicinity. Evidently, as in the case of certain other native orchids (*e.g., Basiphyllaea corallicola, Isotria verticillata, Triphora trianthophora,*) the roots may lie dormant in the ground for two years or more without sending up flowering stalks, but in time attain sufficient vigor to bloom, produce seed, and so keep the species from dying out.

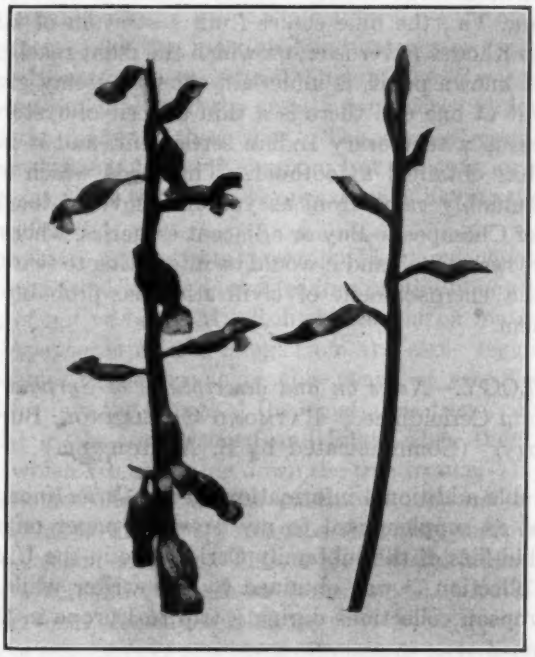

Fig. 1.—*Corallorrhiza odontorhiza* forma *flavida* n.f. Bull Run, Va.

The Crested Coral-root has been studied at a number of localities, and proves to be essentially a neutral, calcareous soil plant. In Tennessee it has been observed to grow both in the cedar glades, rooted in small accumulations of alkaline soil in crevices of limestone rock, and in rich woods in the mountains, where the rocks are not calcareous, but local conditions have favored the thorough decomposition of plant debris into neutral leaf-mold. The habitat at Delaplane,

Va., corresponds to the second of these. Along the Atlantic Coast the soils are predominantly acid, but coquina and shell-marl outcrop in some places, and masses of oyster-shells accumulated by the Indians provide a source of lime for soil-neutralization elsewhere. At the localities of this orchid observed in Florida—where, by the way, it blooms in May, not July or August, as sometimes stated—the soil is sandy, but shell material of one or the other of these origins lies not far beneath the surface, so that the reaction is essentially neutral. The same relation holds at the town of Bluffton, S. C., at the south edge of which a large colony occurs, blooming in mid-June. At Williamsburg, Va., the lime comes from a stratum of large Pecten shells. The Rhodes River islet, on which the plant reaches its northeasternmost known point, is underlain chiefly by clay giving rise to acid soil, but at one end there is a thin deposit of oyster-shells, evidently marking a temporary Indian settlement, and it is here that the plant has obtained a foothold. The seeds which started this colony presumably came from as yet undiscovered localities along the shores of Chesapeake Bay or adjacent estuaries, where calcareous outcrops are occasional, and it would be interesting to search for these, although the encroachment of civilization has probably destroyed most of them.

ENTOMOLOGY.—*Notes on and descriptions of Syrphid flies of the subfamily* Cerioidinae.[1] RAYMOND C. SHANNON, Bureau of Entomology. (Communicated by S. A. ROHWER.)

Considerable additional information on the *Cerioidinae* which may be regarded as supplemental to my previous paper on this group, "The Syrphid-flies of the subfamily Cerioidinae in the U. S. National Museum Collection,"[2] was obtained by the writer while examining certain European collections during a trip to Europe in the summer of 1925.

I wish especially to thank Professor Hervé-Bazin, Major E. E. Austen, and Professor Mario Bezzi for the facilities they afforded me in this work.

The Cerioidine flies are the most attractive in appearance of the *Syrphidae* and this, together with their comparative rarity, have made them highly prized by collectors. There appears to be a sur-

[1] Received Nov. 16, 1926.
[2] Ins. Ins. Mens. 13: 48–65. 1925.

prisingly large number of species for the unusual type of development which characterizes the subfamily. More than 120 species are known, mostly from the tropics, and, as a rule, the species are very distinct in form and color. Comparatively few synonyms (about ten) have been made in the group, although thirty writers have proposed names for the species.

The resemblance of the different species of *Cerioidinae* in appearance and behavior to various species of *Hymenoptera*, combined with the coincidental occurrence of the resemblants in the same region, is extraordinary and seemingly indicates true mimicry. Most of them simulate different species of wasps while a few have the appearance of certain saw-flies. The two most striking features of their similarity are the greatly extended antennae (long in the *Hymenoptera* and short in most *Syrphidae*) and the greatly constricted abdomen in the majority of the forms of these flies. The species resembling saw-flies have the abdomen broad throughout but the anterior corners are yellow, giving the flies the offhand appearance of having the abdomen petiolate basally.

One of the latter group, from Australia (*Tenthredomyia mellivora*), has been reared from larvae found feeding on the honey in the nest of a species of native bee. Mr. Rohwer has shown me a species of saw-fly, *Pterygophorus cinctus* Klug, from the same region which it closely resembles. The larvae of this genus of saw-flies are gregarious and feed on the foliage of the eucalyptus trees. Froggat has recorded that cattle are poisoned and killed when they feed upon these larvae which are migrating down the tree trunks. It is possible that the adult saw-flies retain the poisonous qualities of the larval stage and, if this is the case, it may be that they are purposely let alone by predaceous enemies. This, if true, would indicate that the resemblance which the fly bears to the saw-fly may be of more importance than mere chance resemblance.

The pupa of a number of species of *Cerioidinae* have been found on tree trunks but only in one other species, *Cerioides conopoides* (Linnaeus) is there anything known of the larval habits of these flies. Larvae of *C. conopoides* have been found in the sap of diseased poplars and other trees and in ulcers on elms.

Prior to the writer's paper, noted above, only one generic name, *Cerioides*, was valid in the subfamily. Two others, *Ceria* and *Sphiximorpha*, have been repeatedly used, sometimes for the purpose of indicating generic differences between species, although *Ceria* is a

preoccupied name and *Sphiximorpha*, at the time of its erection, was given the same genotype which had been previously assigned to *Cerioides*.

In the writer's treatment of the subfamily, four genera, *Cerioides*, *Monoceromyia* (originally considered as a subgenus[3]), *Tenthredomyia*, and *Polybiomyia* (the last two being newly proposed) were recognized; and, insofar as the material (rather limited in exotic forms) at hand permitted, the species were located in their respective genera. Moreover, he called attention to the apparent absence of another generic type, as follows: "It appears that there should be a fifth group or genus which is not represented in the material at hand. It should be of a more generalized nature characterized by an unconstricted abdomen and a short or absent antennifer."

A species which fits these requirements was found in the collection of M. Hervé-Bazin, namely *Cerioides petri* Hervé-Bazin, from Kumanotaira, Karuizawa, Japan. This species is made the type of the new genus *Primocerioides*.

The writer has examined seventy-seven species of *Cerioidinae* (27 species recorded in his first publication) and finds that all of them may be placed without difficulty in the four genera he defined in his previous paper, except *C. petri* Hervé-Bazin, which, as has just been stated, becomes the type of a new genus. The species not seen by the writer have been located in their respective genera as well as the published descriptions will permit. A list of the genera with the species which they contain is appended at the end together with the distribution of each species.

The geographic distribution of the genera turns out to be remarkably consistent.

Primocerioides (1 species)—Palearctic (Japan).

Tenthredomyia

Subgenus *Tenthredomyia* (16 species)—Holarctic, usually northern latitudes or high altitudes (such as the Canadian zone).

Subgenus *Pterygophoromyia* (3 species)—Australia.

Monoceromyia (40 species)—Mainly in the tropics of both hemispheres. Two species occur in Australia; twelve in Africa, none in Europe or temperate America.

Cerioides (35 species)—In all continents.

Polybiomyia (15 species)—Tropical America and southwestern United States; one species from Malaysia (Aru Islands) and one from Natal, Africa.

[3] Bull. Brook. Entom. Soc. 16: 33. 1922.

Cerioides is the most widely distributed of the genera and at the same time contains the most diverse set of species.

Polybiomyia is mainly confined to the new world. The occurrence of one species of the genus, *P. smaragdina* (Walker), remarkable for its entirely green metallic coloration, in the Aru Islands of Malaysia, is of particular interest inasmuch as *Crepidomyia ventralis* (Walker), a genus and species of the *Xylotinae*, also occurs in the Aru Islands; all other species of *Crepidomyia* are known only from South America. *Polybiomyia divisa* (Wiedemann), recorded from Natal, Africa, is peculiar in its venation and could well be considered as a different subgenus.

Pterygophoromyia, a subgenus of *Tenthredomyia*, differs from all other *Cerioidinae* (except *Primocerioides?*) in having a plumose filament (the plumula) attached to the thorax just below the squama, the absence of which was formerly considered to be one of the characters of the subfamily.[4]

KEY TO THE GENERA OF CERIOIDINAE

A 1. Antennal process (antennifer) very short or absent, rarely equaling half the length of first antennal joint.
  B 1. Abdomen not constricted basally; eyes pilose ..... **Primocerioides**, new genus
  B 2. Abdomen constricted basally; eyes bare.
    C 1. Metasternum membranous behind ..... **Cerioides** Rondani
    C 2. Metasternum completely girdled with chitin ..... **Polybiomyia** Shannon

A 2. Antennifer very elongate, distinctly longer than first antennal joint
  B 1. Abdomen very slightly and progressively narrowed basally, anterior corners bright yellow ..... **Tenthredomyia**, Shannon
    C 1. Plumula absent ..... **Tenthredomyia**, *sensu stricto*
    C 2. Plumula present ..... **Pterygophoromyia**, new subgenus
  B 2. Abdomen strongly constricted at juncture of the first and second segments, usually the main length of the second segment contracted into a long petiole ..... **Monoceromyia**, Shannon.

Primocerioides, new genus

Genotype *Ceriodes* (sic!) *petri* Hervé-Bazin, Ann. Soc. Entom. France **83**: 414. 1914.

The characters given in the key will serve to distinguish this new genus. The absence of the antennifer and the nonconstricted abdomen mark this genus as the most generalized one in the sub-family *Cerioidinae*.

The genotype, which is peculiar in several respects, is the only species known in this genus. The pubescence is unusually developed, the eyes and face being distinctly pilose; the first antennal joint is long, the second short, and the third fairly long; the third longitudinal vein is straight and bears an appendix projecting into the first posterior cell.

[4] SHANNON, *A reclassification of the subfamilies and genera of North American* Syrphidae, Bull. Brook. Entom. Soc. **16**: 67. 1921.

Only the type specimen, a male, in the collection of M. Hervé-Bazin, is known.

Type locality, Kumanotaira, Karuizawa, Japan.

AUSTRALIAN CERIOIDINAE

Four species of *Cerioidinae* have been described to date from Australia. Three other species are now at hand and a possible fourth has been mentioned in a paper by G. H. Hardy, "Notes on some Australian Syrphidae." This latter species may be the same as the one described below as *Monoceromyia hardyi*, new species.

KEY TO SPECIES OF AUSTRALIAN CERIOIDINAE

A 1. Antennifer not developed; abdomen constricted basally; third vein moderately curved downwards, without appendix on the loop
Cerioides breviscapa (Saunders)

A 2. Antennifer very elongate, longer than first antennal joint.

B 1. Abdomen not constricted basally; plumula present
TENTHREDOMYIA (Subgenus PTERYGOPHOROMYIA)

C 1. First tergite entirely orange red; second almost entirely black without callosities; third tergite of male with a prominent tubercle
T. saundersi Shannon

C 2. First tergite blackish with yellow anterior corners; second largely yellow with a pair of lateral callosities; the third without tubercle.

D 1. Meso- sterno- and pteropleura with yellow
T. ornata (Saunders)

D 2. Mesopleura only with yellow.....**T. mellivora,** new species

B 2. Abdomen strongly constricted basally; plumula absent MONOCEROMYIA

C 1. Thorax without yellow markings except on the humeri, notopleurae and scutellum; wings entirely infuscated
M. austeni, new species

C 2. Thorax with numerous yellow markings; wings infuscated only on anterior border.....**M. hardyi,** new species

CERIOIDES BREVISCAPA (Saunders)

Ceria breviscapa Saunders, Trans. Entom. Soc. London **4:** 65. 1847.
Ceriodes breviscapa (Saunders) Hardy, Australian Zoologist **2:** 13. 1921.

This species has some affinities with species of *Monoceromyia* and *Tenthredomyia.*

Originally recorded from Port Philip, South Australia. Hardy reports one specimen from South Australia and four from New South Wales.

Type.—In the British Museum.

Genus TENTHREDOMYIA Shannon

Subgenus **Pterygophoromyia,** new subgenus

TYPE.—*Tenthredomyia saundersi* Shannon.

The subgenus *Pterygophoromyia* is characterized by the presence of a small but distinct plumula (a plumose filament attached to the thorax just below the squama). The subgenus, so far as known, is confined to Australia.

TENTHREDOMYIA (PTERYGOPHOROMYIA) ORNATA (Saunders)

Ceria ornata Saunders, Trans. Entom. Soc. Lond. **4**: 64, *pl. 4, fig. 3, 3a, 3b.* 1845.

Ceria australis Macquart (synonym?) Dipt. Exot. Suppl. **4**: 128. 1849.

"*Cerioides ornata* Saunders," Hardy, Australian Zoologist **2**: 13. 1921.

Tenthredomyia australis (Macquart) Shannon, Ins. Ins. Mens. **13**: 54. 1925.

A male specimen at hand (previously recorded by the writer as *T. australis* Macquart) agrees with *T. ornata* except in some particulars found in the original description as regards the abdominal coloration. The original description and figure indicate that the basal segment is reddish, margined behind with yellow, with the anterior corners yellow and equal in length to the second segment. The female is figured and shows only four segments, the first of which equals the third in length. There should be five segments shown for the female, and apparently that which is intended for the first is the first and second combined, which together equal the length of the third. The specimen at hand differs from the description and figure in having the first segment more extensively darkened; but it agrees otherwise with the type of *C. ornata* according to my examination of the type. The type of *C. ornata* has the fourth tergite margined behind with yellow, contrary to the impression given in the description.

The description of *C. australis* (Macquart) agrees with *T. ornata* except that the first antennal joint is stated to be as long as the antennifer, and in the figure given for *C. australis* the first joint is shown to be as long as the antennifer and equal in length to the following two combined. The first joint in *T. ornata* is scarcely more than half the length of the antennifer and the three joints are nearly of equal length.

Hardy states under "*Cerioides ornata* Saunders" that there were two species standing in the collection of the Macleay Museum under this name. One was characterized by a pair of callosities on the second segment, the other not having these callosities. These callosities are present in *T. ornata* (Saunders) and *T. mellivora* (new species, described below) but are absent in *T. saundersi*. They are less developed in the female than in the male.

Tenthredomyia (PTERYGOPHOROMYIA) **mellivora,** new species.

Closely related to *T. ornata* Saunders. Differs chiefly in having the yellow on the pleurae confined to the mesopleura and in having the second sternite black with the hind margin yellow and the third tergite entirely black. In *T. ornata* the second tergite is almost entirely yellow and the hind margin of the third is yellow. The ocellar triangle of the male is equilateral and the callosities on the second tergite are more prominent than in *T. ornata*. In the female the eyes converge as closely together at the vertex as in the male but widen rapidly downwards; the center of the front has a very large black spot which includes the ocelli. The fifth tergite is obscurely reddish yellow. Length, about 12 mm., not including antennifer which is 1.5 mm.; antennifer and antenna combined, 5 mm.; wing 13 mm.

Described from two males and four females; eight additional specimens are in the British Museum.

Type.—Male; allotype female, in the British Museum; paratypes in the U. S. National Museum. Cat. No. 40105 U. S. N. M.

Two specimens have been reared and the puparia are mounted with the specimens and bear the label "Larvae live on honey in native bee's nest." (Note by donor).

Type locality.—Burpengary, South Queensland, (T. L. Bancroft).

TENTHREDOMYIA (PTERYGOPHOROMYIA) SAUNDERSI Shannon

Tenthredomyia saundersi Shannon, Ins. Ins. Mens. **13:** 53. 1925.

Original description based on a single male. The collection of the British Museum contains one male and four females. The species is nearest to *T. ornata* Saunders. In addition to the characters given for the male in the original description attention may be called to the differences existing between the females of the two species. The front is much narrower in *T. saundersi* and widens rather gradually downwards; the black spot on the front is much smaller and below the middle; first tergite reddish yellow, the sides yellow, a little darkened at the middle of the hind margin; second tergite velvety black with a bright yellow hind margin; abdomen without callosities; the yellow spot on the pleurae confined to the mesopleura.

Type.—In U. S. National Museum.

Type locality.—New South Wales: Sidney (January, 1900, Mackay).

Other localities.—Queensland: Burnett River (T. L. Bancroft); Mackay (G. Turner).

Genus MONOCEROMYIA Shannon

Monoceromyia SHANNON, Bull. Brook. Entom. Soc. **17:** 32. 1922; Ins. Ins. Mens. **13:** 50. 1925.

The only intimation of the occurrence of this genus in Australia was that given by Hardy in the Australian Zoologist (vol. 2, p. 13, 1921). He calls attention in this publication to a species occurring in Queensland and New South Wales which has a greatly constricted abdomen and has the third vein of the wing deeply looped into the first posterior cell. No mention is made of the length of the antennifer, but a further characteristic noted by Hardy, namely, that the wing is infuscated above the third vein except the area within the deflected portion of the third vein, indicates a possible relationship with the species here described under the name *M. hardyi.*

Monoceromyia hardyi, new species

Male.—Rather small species, mostly dark with reddish yellow and yellow markings. Ocellar region black, remainder of vertex yellow; frontal triangle yellow, very broad and short; antennifer yellowish brown, distinctly longer than first antennal joint; antenna reddish brown, relative length of joints 1:0.75: 0.60; the base of the third joint nearly equal to its length; style two-thirds the length of the third joint, dark brown; face bright yellow with a black median stripe extending from base of antennae to oral margin and on each side of the face a black stripe extending from the oral angle upwards to the eye; thorax black, humeri and notopleural regions yellow; a pair of small, submedian, prescutellar, yellow spots and another pair of more elongate, sublateral spots which spread on to the postalar calli; scutellum yellow with median black spot bordering on anterior margins, meso- and sternopleurae with yellow spots, the pteropleura partly reddish yellow; legs largely reddish yellow, the femora and tibia partly dark brown; abdomen rather strongly constricted at juncture of first and second segments, third and fourth segments globose; first and second tergites reddish yellow, third and fourth black with reddish yellow hind borders; hypopygium reddish brown; anterior border of wing deeply infuscated; the third vein deeply looped into first posterior cell, without appendix on the loop, the portion of the wing within the deflection and behind the third vein hyaline. Length 11 mm., plus antennifer 12 mm.; wing 8 mm.

Type.—Male, in British Museum.

Type locality.—Queensland: Brisbane (November 12, 1912, H. Hacker).

Named for G. H. Hardy, student of Australian *Syrphidae.*

Monoceromyia austeni, new species

Male.—A larger species than the above, from which it is easily differentiated by the separated eyes, which at their greatest approximation are further apart than the width of the first antennal joint; antennifer and antennae entirely reddish brown; face slightly concaved, rising below to a moderate, keel-like tubercle; thorax black except for humeri and notopleural callosities and hind margin of the scutellum; legs reddish brown, all the femora with rather broad, subbasal dark bands; abdomen strongly constricted on basal half of second segment; first tergite black; second yellow on basal half with a dorsal, median dark line; posterior half of second tergite black, third and fourth tergites blackish with narrow yellow hind borders; hypopygium reddish brown; wings entirely smoky; third vein with loop and a short appendix attached to loop. Length 13.5 mm., with antennifer 14.60 mm., wing 11 mm.

Type.—Male, in British Museum.

Type locality.—Queensland: Brisbane (November 24, 1912, H. Hacker).

Named for Major E. E. Austen, the noted dipterologist of the British Museum.

NEW SPECIES OF ASIATIC CERIOIDINAE

Cerioides meijerei, new species

Large, nearly black species, very close to *C. fruhstorferi* de Meijere.

Female.—Head black, sides of face with a large yellowish spot and a smaller one on eye margin opposite antennal base; antennifer very short, its length about half its breadth; antenna black; first and second joints very elongate, of equal length; the third very small, but little longer than broad, style black; mesonotum black with a very obscure yellow spot on humerus and notopleura; hind margin of scutellum yellowish; pleurae black with an obscure yellowish stripe on mesopleura; legs almost entirely dark reddish brown; abdomen blackish; anterior corners faintly yellowish; petiole of second segment dark brown; second segment greatly constricted and elongate, the two basal segments equal in length to remainder of abdomen; hind margin of third tergite narrowly reddish brown; anterior half of wing deeply infuscated; posterior half faintly infuscated; third vein deeply looped into first posterior cell; the loop without an appendix. Length 18 mm.; wing 13 mm. One female.

C. fruhstorferi differs in having the yellow facial markings much smaller and in having the third vein but little deflected.

Type.—In British Museum.

Type locality.—Indo China: Haut Mekong. Tong Lap. (March 30, 1918, R. V. de Salvaza).

Named for Professor J. C. H. de Meijere, who has worked extensively on the *Cerioidinae* as well as many other groups of *Diptera.*

Tenthredomyia brunettii, new species

Rather small species, superficially related to *Monoceromyia dimidiatipennis* (Brunetti) of India and resembling the North American species *T. tridens* (Loew) and *T. anchoralis* (Coquillett).

Male and female.—Head yellow with black markings as follows: Male, a stripe extending from foremost ocellus to the occipital margin, a spot on each side between the base of antennifer and eye; a small median stripe which fades out half way to the antenna; a black stripe on each side extending between oral margin and eye. Female, the ocellar markings extend as a stripe from the occipital margin to the ocelli, whence a fork extends from each side to the eye, and, continuing along the eye margin, come together and in so doing inclose a yellow spot which lies before the ocelli. Antennifer yellow below, black above, twice the length of first antennal joint which in turn is about equal to the length of each of the other two joints; lower portion of head, behind the lower facial stripes, bright yellow; the yellow of the humerus and notopleura converging into a single spot; a pair of sublateral mesonotal stripes behind the suture; scutellum entirely yellow; meso-sterno- and pteropleurae with yellow; femora yellow, more or less marked with black preapically; tibiae yellow, more or less darkened apically; tarsi more or less darkened; first tergite black with yellow sides, the yellow converging basally; second, third and fourth tergites black with yellow hind borders; hypopygium of male and fifth tergite of female black; anterior border of wing irregularly infuscated, hyaline behind. Length 11 mm., plus antennifer 12 mm.; wing 8 mm. Two males, one female.

Type male and *allotype* female.—In British Museum.

Type locality.—British Baluchistan: Quetta (June 2, 1902, C. G. Nurse).

Monoceromyia dimidiatipennis (Brunetti) most closely resembles this species. Besides the abdominal constriction it differs in being more extensively black. The post oral region is black, the humeral and notopleural yellow markings are separated; and no yellow occurs on the pteropleura.

Named for Mr. E. Brunetti, in recognization of his contributions to our knowledge of Indian *Diptera*.

Tenthredomyia hungkingi, new species

Approaches *Tenthredomyia tridens* (Loew) of North America very closely in size, structure, and color.

Female.—Head largely black; the posterior orbit (space between upper occipital margin and hind margin of eye to ocelli to eye) yellow, a yellow spot present above each antenna; the face yellow with a median black stripe from base of antennifer to oral margin; antennifer reddish yellow; antennae black, mesonotum black, humeri, a small spot on notopleura, a pair of sublateral, postsutural stripes and scutellum yellow; yellow marking on pleurae confined to meso- and sterno-pleurae; legs reddish yellow; femora more or less darkened around the middle; first tergite black with anterior corners yellow; second, third and fourth tergites black with rather narrow yellow hind borders; fifth tergites black; wings infuscated on anterior half. Length 12 mm., plus antennifer 13 mm.; wing 10 mm. Two females.

T tridens differs in having the yellow on the posterior orbit divided by the black extending from the ocellar region, the pteropleura partly yellow and the yellow on the hind borders of tergites two, three, and four expanding on their outer ends (contracting in *T. hungkingi*, particularly on the fourth tergite).

Type.—In British Museum.

Type locality.—China: Hsikon, near Tientsin, (June 17, 1906, F. M. Thomson) Tientsin, (June 15, 1906, F. M. Thomson).

Named for Teou Hung-King, (452-536 A.D.) one of the first Chinese naturalists to record observations on *Syrphidae*—namely *Eristalis tenax* (Linnaeus).

Monoceromyia salvazai, new species

A large, nearly black species.

Male.—Face yellow, flat, with a median raised line extending from antennifer to oral margin which is black; a yellow spot on eye margin opposite base of antennifer; remainder of head black; antennifer and antennae black; antennifer nearly as long as two basal antennal joints; third joint a little more than half the length of second; style black basally, white apically; thorax black with only hind margin of scutellum obscurely yellow; legs largely blackish, the femora apically becoming reddish brown; abdomen strongly constricted at second segment which is as long as the third and fourth combined and reddish brown on the more constricted portion; abdomen otherwise black: wings infuscated anteriorly; third vein sharply looped downwards and with an appendix attached to loop. Length 21 mm., with antennifer, 23 mm.; wing 14 mm. One male.

M. obscura (Brunetti) resembles *M. salvazai* in general appearance and color but is a smaller and more slender species with the mesonotum subquadrate. In *M. salvazai* the mesonotum is much longer than broad.

Type.—In British Museum.

Type locality.—Luang Prabang: Ban Sen Savouane (March 16, 1920, R. V. de Salvaza).

Named for Mr. R. V. de Salvaza, the collector.

Monoceromyia wiedemanni, new species.

Fairly large, nearly black species, very closely allied to *M. obscura* Brunetti.

Male.—Head black, a pair of yellow spots, one on eye margin opposite base of antennifer, and a large yellow marking on each side of face; antennae black, the joints of equal length, the basal two equal to length of antennifer; style grayish; thorax black with yellow only on the humeri and hind scutellar margin; legs brownish black; abdomen strongly constricted at second segment, which is as long as the following two segments, the constricted portion brownish; extreme hind edge of third tergite brown, slightly raised; remainder of abdomen shining black; the fourth tergite towards the hind margin with a deeply impressed transverse line; wings deeply infuscated anteriorly; third vein moderately looped downwards. Length 15 mm., with antennifer, 16.5 mm.; wing 11 mm. One male.

M. obscura differs in having the antennifer shorter, less than length of the two basal antennal joints; the frons yellow in the male, and no constriction before the hind margin of the fourth tergite.

Type.—In British Museum.

Type locality.—Indo China: Luang Prabang, Ban Nam Mo. (March 3, 1918, R. V. de Salvaza).

Named for C. R. W. Wiedemann, the first to describe a species of *Ceriodinae* from the Asiatic region (*Ceria javana*, 1824).

Monoceromyia wallacei, new species

A rather large species, predominantly black, with yellow and brownish markings. Closely allied to *M. tridecimpunctata* (Brunetti).

Female.—Head black, a yellow spot on eye-margin opposite base of antennifer; face with a broad yellow stripe on each side; antennifer reddish yellow; antennae reddish brown, first joint a little longer than second which is equal to third; the two basal joints equal to antennifer; thorax with yellow on the humeri, a small spot on notopleura, a pair of postsutural stripes,

hind margin of scutellum, and part of the meso- and sternopleura; legs reddish brown, tarsi darker, basal halves of tibiae yellowish; anterior corners of first tergite yellow, sides of constricted portion of second tergite yellowish brown; hind margins of second, third and fourth tergites narrowly yellow, all three of which are slightly rimmed; fifth tergite black; wings dilutely infuscated on anterior margin; third vein moderately looped, without appendix. Length 17 mm., with antennifer 18.5 mm.; wing 14 mm. Described from one female.

Type.—In British Museum.

Type locality.—Celebes: Macassar (1857, A. R. Wallace).

Named for the famous naturalist, A. R. Wallace, who collected it.

Monoceromyia hervebazini, new species

A large black species with yellow markings.

Male.—Face yellow with a median longitudinal black stripe which at the base of the antennifer sends out arms to the eye margins; remainder of head black; antennifer and antenna blackish, last joint dark brown; style whitish; thorax black with humeri yellow, a small yellow spot at outer end of transverse suture; meso- and sternopleurae partly yellow; legs reddish brown, more yellowish on basal half of hind femur; first tergite black; the second constricted and elongated, one-fourth longer than the third, yellowish on the most slender portion, with a dark median stripe; posterior third broadened, blackish; third tergite black, hind border yellow, the sides rimmed, the impressed line crossing the tergite along the anterior margin of the yellow border; fourth tergite black, the sides rimmed, the impressed line crossing the tergite near its hind border and producing a deep constriction, behind the constriction the tergite is brownish, with the extreme hind edge yellow; hypopygium black; wing rather dilutely infuscated on basal and anterior half, leaving the outer posterior quarter, nearly hyaline; length 18 mm., plus antennifer 19.5 mm.; wing 14 mm. Two males.

Monoceromyia trinotata de Meijere has the third and fourth tergites deeply constricted near the hind margins by means of impressed lines, but this species is smaller, more slender, second abdominal segment much more elongate and possesses a number of yellow markings which are absent in *M. hervebazini.*

Type.—In British Museum.

Type locality.—Shanghai, China (1854, Fortune).

Named for M. Hervé-Bazin, an eminent dipterist of France, who is greatly interested in the Chinese fauna, having made a very extensive collection there.

KEY TO THE ASIATIC SPECIES OF CERIOIDINAE AT HAND.

(Measurements do not include antennifer)

A 1. Antennifer undeveloped; third vein deeply looped; abdomen strongly constricted basally; black species with yellow facial markings; 18 mm. (Indo China).....**Cerioides meijerei** Shannon

A 2. Antennifer greatly elongated.

B 1. Abdomen not, or very slightly, constricted basally, with yellow apical corners: TENTHREDOMYIA.

C 1. Thorax with yellow only on humeri and disk of scutellum. (China) **T. grahami** Shannon

C 2. Pleurae with yellow and additional yellow markings on mesonotum.
D 1. Yellow on notopleura confluent with yellow on humeri; pteropleura partly yellow (Baluchistan).....**T. brunettii,** Shannon
D 2. Yellow on notopleura widely separated from that on humeri; pteropleura without yellow (China)....**T. hungkingi** Shannon
B 2. Abdomen strongly constricted at second segment; with or without yellow basal corners: MONOCEROMYIA
C 1. Third tergite equal to or longer than the second; pleurae without yellow markings; 20 mm. (China).....**M. pleuralis** (Coquillett)
C 2. Third tergite much shorter than second.
D 1. Entire body, including wings, blackish except a pair of narrow, yellow facial stripes and white style; 25 mm. (Philippines)
M. petersi (Speiser)
D 2. Wings with strong contrast between the infuscation on anterior border and the hyalinity of posterior border; head and usually the body with more yellow.
E 1. Pleurae entirely black.
F 1. Thorax black except hind scutellar margin; male without deep impressions on tergites; 20 mm. (Indo China)
M. salvazai, Shannon
F 2. Thorax with humeri at least obscurely yellow.
G 1. Antennifer as long as combined length of first and second joints; 15 mm. (Indo China)..**M. wiedemanni** Shannon
G 2. Antennifer shorter than the two basal joints 15 mm. (India).....**M. obscura** (Brunetti)
E 2. Pleurae marked with yellow.
F 1. Meso-sterno- and pteropleurae marked with yellow.
G 1. Post oral region black; mesonotum without post sutural markings or prescutellar spot; scutellum yellow with a median black spot dividing the yellow; 20 mm. (Malasia)
M. javana (Wiedemann)
G 2. Post oral region yellow; mesonotum with a pair of yellow post sutural stripes and a prescutellar spot; scutellum black, the hind margin yellow; 16 mm. (India)
M. trinotata (de Meijere)
F 2. Meso- and sternopleurae only with yellow; mesonotum with a pair of post sutural yellow stripes.
G 1. Post oral region yellow; 16 mm. (India; Malacca?)
M. ?tridecimpunctata (Brunetti)
G 2. Post oral region black; 18 mm. (Celebes)
M. wallacei Shannon
F 3. Mesopleura only with yellow; post sutural stripes obscure brown; 16 mm. (China).....**M. wui** Shannon

LIST OF THE SPECIES OF CERIOIDINAE

Arranged according to the present generic concept. Those species marked by an * have been examined by the writer.

PRIMOCERIOIDES Shannon

*petri (Hervé-Bazin) (Cerioides) Japan

CERIOIDES Rondani

North and Central America and the West Indies

cylindrica (Curran) (Ceria)	California
*durani Davidson	Arizona
*loewii (Williston) (Ceria)	California
ontarioensis (Curran) (Ceria)	Ontario
signifera (Loew) (Ceria)	U. S. (?) Mexico
*willistoni (Kahl) (Ceria) = signifera (Loew)?	Pa., Md., La., Tex.

South America

*barbipes (Loew) (Ceria)	Brazil
bigotii (Williston) (Ceria)	Brazil, Bolivia
boliviana (Kertesz) (Ceria)	Bolivia
*brauerii (Williston) (Ceria)	Brazil
facialis (Kertesz) (Ceria)	Paraguay
flavosignata (Kertesz) (Ceria)	Bolivia, Peru
*meadei (Williston) (Ceria)	Brazil
*mikii (Williston) (Ceria)	Brazil
nigripennis (Williston) (Ceria)	Mexico
picta (Kertesz) (Ceria)	Boliva, Peru
pyrrhocera (Kertesz) (Ceria)	Bolivia
*roederii (Williston) (Ceria)	Brazil
sackenii (Williston) (Ceria)	Brazil
superba (Williston) (Ceria)	Mexico
trichopoda (Kertesz) (Ceria)	Bolivia
variabilis (Kertesz) (Ceria)	Bolivia, Peru
vicina (Kertesz) (Ceria)	Peru
wulpii (Williston) (Ceria)	Brazil, Bolivia

Europe, Western Asia, Northern Africa

*subsessilis (Illiger) (Ceria)	Europe, etc.

Asia and Malaysia

*decorata (Brunetti) (Ceria)	India
fruhstorferi (de Meijere) (Ceria)	India
fulvescens Brunetti (Ceria)	India
*meijerei Shannon	Indo China
triangulifera Brunetti (Ceria)	India

Africa

bezzi Hervé-Bazin

Australia

*breviscapa (Saunders) (Ceria)	South Australia

TENTHREDOMYIA Shannon

North America

*abbreviata (Loew) (Ceria)	Eastern North America
**proxima* (Curran) (*Ceria*) = *abbreviata* (Loew)	Canada, New England
*anchoralis (Coquillett) (Sphiximorpha)	New Mexico
pictula (Loew) (Ceria)	Southern United States
sartorum (Smirnov) (Cerioides)	Turkestan
*snowi (Adams) (Sphiximorpha)	New Mexico
*tridens (Loew) (Ceria)	West of the Rocky Mountains

Europe, Western Asia, Northern Africa

*conopoides (Linnaeus) (Musca)	Mediterranean countries, Persia
*vespiformis (Latreille) (Ceria)	Mediterranean countries.

Asia, Malaysia

*annulifera (Walker) (Ceria)	New Guinea
*brevis (Brunetti) (Ceria)	India
*brunettii Shannon	Baluchistan
compacta (Brunetti) (Ceria)	India
*dimidiatipennis (Brunetti) (Ceria)	India
*grahami Shannon	China
*hungkingi Shannon	China
metallica (Van der Wulp) (Ceria)	New Guinea
ornatifrons (Brunetti) (Ceria)	India
relicta (Walker) (Ceria)	Aru Islands
(Saunders)? relictura (Walker) (Ceria)	Aru Islands

Australia

(Belongs to subgenus *Pterygophoromyia*)

australis (Macquart) (*Ceria*) = ornata (Saunders)?	Tasmania
*mellivora Shannon	South Queensland
*ornata (Saunders) (Ceria)	New South Wales
*saundersi Shannon	New South Wales

MONOCEROMYIA Shannon

North America

*cacica (Walker) (Ceria)	Mexico
*daphnaeus (Walker) (Ceria)	Jamaica
*tricolor (Loew) (Ceria)	West Indies, Florida
*veralli (Williston) (Ceria)	Panama

South America

bicolor (Kertesz) (Ceria)	Peru, Bolivia
lynchii (Williston) (Ceria)	Brazil

Europe

None

Asia and Malaysia

anchorata (Bigot) (Sphiximorpha) = lateralis (Walker)?	Borneo
annulata (Kertesz) (Cerioides)	Fuhosho; Toyenmongai
bakeri Shannon = petersi (Speiser)	Philippines
(Synonymy based on a comparison of *M. petersi* in Bezzi's collection.)	
crux (Brunetti) (Ceria)	India
*eumenioides (Saunders) (Ceria)	India
*fenestrata (Brunetti) (Ceria)	India
flavipennis (de Meijere) (Ceria)	India
*hervebazini Shannon	China
*himalayensis (de Meijere) (Ceria)	India
*javana (Wiedemann) (Ceria)	Malaysia
*lateralis (Walker) (Ceria)	Malaysia
*obscura (Brunetti) (Ceria)	India
*patricia (Brunetti)	India
*petersi (Speiser)	Philippines
*pleuralis (Coquillett) (Sphiximorpha)	Japan
*polistoides (Brunetti)	India
*salvazi Shannon	Indo China
similis (Kertesz) (Cerioides)	Formosa
tibialis (Kertesz) (Cerioides)	New Caledonia
*tridecimpunctata (Brunetti) (Ceria)	Indo China
*trinotata (de Meijere) (Cerioides)	India
*wallacei Shannon	Celebes
*wui Shannon	China
*wiedemanni Shannon	Indo China

Africa

afra (Wiedemann)	Cape of Good Hope
ammophilina (Speiser) (Cerioides)	Kilimandjaro
brunneipennis (Loew) (Ceria)	South Africa
*caffra (Loew) (Ceria)	South Africa
congolensis Bezzi	Belgian Congo
frenata (Loew) (Ceria)	Cape of Good Hope
*gambiana (Saunders) (Ceria)	Gambia
*hopei (Saunders) (Ceria)	Sierra Leone
maculipennis (Hervé-Bazin) (Cerioides)	Belgian Congo
*neavei (Bezzi) (Cerioides)	Uganda
*pulchra (Hervé-Bazin) (Cerioides)	Belgian Congo, Rhodesia
*speiseri (Hervé-Bazin) (Cerioides)	Uganda

Australia

*austeni Shannon	Queensland
*hardyi Shannon	Queensland

POLYBIOMYIA Shannon

North and Central America

arietis (Loew) (Ceria)	Mexico
*bellardii Shannon	Texas
*bergrothi (Williston) (Ceria)	Mexico
*captis Curran	Mexico
*engelhardti Shannon	Arizona
*macquarti Shannon	Texas, Mexico
*nigra (Bigot) (Sphiximorpha)	Mexico
*pedicellata (Williston) (Ceria)	Mexico
*rufibasis (Bigot) (Sphiximorpha)	Mexico
*sayi Shannon	Arizona
*schnablii (Williston) (Ceria)	Mexico
*schwarzi Shannon	Panama
*townsendi (Snow) (Ceria)	Texas, New Mexico, Arizona

Malaysia

*smaragdina (Walker) (Ceria)	Aru Islands

Africa

*divisa (Walker) (Ceria)	Natal

Errata to the "Syrphid-flies of the subfamily Ceriodinae," R. C. Shannon,[5]
Ceriodinae, spell *Cerioidinae*.
Ceriodes, spell *Cerioides*.
acica Walker, p. 64, spell *cacica* Walker.
Quotation marks should be placed about the descriptions of *Polybiomyia captis* Curran and *Cerioides durani* Davidson, given in the keys, in order to give these authors full credit for these species.

SCIENTIFIC NOTES AND NEWS

ARTHUR M. PIPER has been appointed Assistant Geologist in the Geological Survey and has been assigned to the Water Resources Branch.

S. SPENCER NYE, Junior Geologist in the Geological Survey, has been transferred from the Geologic Branch to the Water Resources Branch.

The twenty-fifth anniversary of the establishment of the National Bureau of Standards was celebrated on December 4, 1926, by an exhibit of apparatus and methods at the Bureau, a reception and luncheon, and a dinner in the evening at which Dr. S. W. STRATTON, the first director of the Bureau, was a guest.

[5] Ins. Ins. Mens. 13: 48–65. 1925.

The annual exhibit representing work of the departments of the Carnegie Institution of Washington was held at the Institution on December 11 to 13, 1926.

Professor THEODOR VON KARMAN, dean of the Aerodynamic Institute of the University of Aachen, Germany, gave a series of six lectures at the National Museum on *Modern development of aerodynamic theories*, on December 3 to 13, under the auspices of the Daniel Guggenheim Fund for the Promotion of Aeronautics.

The Pick and Hammer Club met at the Geological Survey on December 11. W. T. THOM reported on the symposium on the hypothesis of continental sliding, held at the New York meeting of the Association of Petroleum Geologists; and A. C. LAWSON described his recent trip through Africa.

The Petrologists' Club met at the Geophysical Laboratory on December 14. G. TUNELL described his observations on *Oxidation of low-grade porphyry copper ores;* H. E. MERWIN and H. S. WASHINGTON discussed *The relation of the optical properties to the composition of monoclinic pyroxenes;* and W. T. SCHALLER gave brief notes on *Hydrates of the borax group.*

At a joint meeting of The ACADEMY and the Chemical Society on December 16, 1926, the first part of the program consisted of the presentation of the John Scott Medal and an award of one thousand dollars to Dr. HARVEY C. HAYES of the Navy Department in recognition of his work on sonic sounding. The presentation was made by a representative of the Board of Directors of City Trusts of Philadelphia, and was acknowledged by Assistant Secretary WARNER of the Navy Department and by Dr. HAYES. The second part of the program consisted of a lecture by Professor J. N. BRÖNSTED, of the University of Copenhagen, on *The metal-amines and their significance for the physical chemistry of solutions.*

The ACADEMY held its annual meeting at the Bureau of Standards Tuesday evening, January 11. Dr. G. K. BURGESS, the retiring president gave an illustrated address on the work of the Bureau, after which the laboratories were open for inspection, tests of various kinds being shown.

Initial arrangements are being made for the repair of the CARNEGIE during 1927 in accordance with the appropriation made by the Board of Trustees of the Carnegie Institution of Washington on December 10, 1926, for the rehabilitation of that vessel, which must precede the three-years' cruise to begin in 1928.

Mr. GISH returned to Washington from his trip in Europe December 23 and is now preparing his report on the conferences held with various European scientists interested in earth-currents and atmospheric electricity.

Mr. O. DAHL, who was aviator and assistant to Dr. SVERDRUP during the Arctic Drift Expedition of 1922 to 1925, was appointed to the staff of the Department beginning January 1 and has been assigned to the work being done by Drs. BREIT and TUVE.

The time of the Third General Assembly of the International Union of Geodesy and Geophysics at Prague has been set, for the general meetings, from September 4 to 11, 1927; preliminary meetings of the various sections preceding the general meetings are expected to begin August 28.

Messrs. RALPH W. G. WYCKOFF and STERLING B. HENDRICKS have resigned from the staff of the Geophysical Laboratory, Carnegie Institution of Washington, to take up X-ray investigation at the Rockefeller Institute for Medical Research, in New York.

Commander N. H. HECK has returned to Washington after completing inspection duty in the Hawaiian Islands.

Professor A. S. HITCHCOCK has returned from Cuba, where he spent about a month collecting grasses. He visited the Jata Hills near Guanabacoa accompanied by Brother Léon of the Colegio de La Salle. These barren serpentine hills east of Havana support a characteristic vegetation. The pine woods of Pinar del Rio were investigated in company with Brother Léon and Professor Roig, botanists who have done much to increase our knowledge of Cuban plants. Stops were made at two laboratories having facilities for visiting scientists. The first called Harvard House, is under the auspices of Harvard University, and is located at Soledad, near Cienfuegos, on a sugar plantation. In connection with Harvard House is a fine botanical garden. The second laboratory is in charge of the Tropical Plant Research Foundation, which has its Cuba division at Baraguá (Province of Camaguey) on a large sugar plantation. Through the courtesy of the United Fruit Company Professor Hitchcock was able to visit the Company's plantations at Guaro and Preston (Province of Oriente) and to investigate the pine forests of the Sierra Nipe.